The proportions are such as one sees in figures in painting. certain stained-glass windows and in mediæval illuminations; observe the plane of the elbows and the strange disproportion One can hardly imagine normal upper and in the entire arms. lower arm bones fitting into the ill-drawn shapes into which I have sketched the bones. The radius and ulna of both arms, instead of being much shorter than the humerus, would, if inserted, be longer. If the left humerus of the figure is assumed to be correct in length as shown from A to B in my added black line, then the true length of the ulna should only reach from B to C, and not be half as long again as in the painting. On the other hand, if the length of the right ulna is considered correct as from D to E in my added black line, then the humerus would, in nature, reach from E to F-assuming the relative proportions of humerus and ulna to be 13 and $10\frac{1}{2}$. It is quite within the bounds of possibility to name the painter of this strange figure.

The fold of the shroud is just over the top of the head, yet the painter was so incompetent to deceive that he made the two head-tops touch, like two hemispheres—as shown in the outline

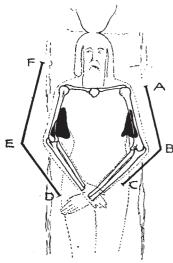


Fig. 1.—Reduced outline of figure on Shroud with arm bones drawn in. -Reduced outline of figure on Holy

-whereas if the material had been folded over a head, a space of 6 inches would have necessary for been covering the neighbourhood of the junction of the coronal with the saggital suture. painted, the shroud appears to have been folded over a piece of flat pasteboard.

As for an artistespecially a mediæval one - being able to paint a picture in imitation of a negative, as suggested Бy Meldola, I have never heard of such a work, but if the painter of this picture had used an inferior white pigment as a body colour, as one of the compounds of carbonate or hydrate of lead, and heightened the light

places with this white colour, all the whites by this time would have become black or nearly so, and the positive of mediæval times would be a present-day negative.

When I repainted Sowerby's models of fungi in the British Museum, all Sowerby's whites had become a leaden-black. One sees the same result of time with inferior whites in old coloured

The triangular black patches in the outline are damages upon the shroud. WORTHINGTON G. SMITH. Dunstable.

The Theory of Laughter.

PROF. SULLY has given us in his latest work a model monograph on laughter. With much charm and penetration, and in the light of a wide knowledge of the very extensive literature of the subject, he discusses the nature, causes and effects of laughter, its uses, its origin, its development and its future in the race and in the individual. He criticises the more important of the many theories of the ludicrous propounded by philosophers in all ages; he shows that each one of them fails to account for a considerable proportion of the many varieties of the ludicrous, and he concludes "that the impressions of the laughable cannot be reduced to one or two principles." While thus recognising the impossibility of bringing all kinds of laughter-causing things under one formula, Prof. Sully points to two causes of laughter which are closely allied and frequently cooperate, namely a sudden oncoming of gladness and a sudden release from constraint, and these, he regards as the two

1 "An E say n Laught r." James Sully, M.A., LL.D. Pp. xvi+441. (London: Longmans, Green and Co., 1902.) Price 12s. 6d. net.

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principles most generally applicable to the explanation of the nature of the ludicrous. There is implied here and throughout the book the assumption that "the laugh . . . is in general an expression of a pleasurable state of feeling," an assumption which finds also explicit expression in several passages, e.g. "that outburst of gladness which we call laughter" and "laughter being primarily the expression of the fuller measure of the happy or gladsome state." It is assumed, in fact, that that which makes us laugh does so in general in virtue of its pleasing us, or, more shortly, that in general we laugh because

we are pleased.

This assumption, which is implied in several of the older theories of the ludicrous, seems to be regarded as self-evident and in need of no justification, and yet it logically leads to some strange and startling conclusions. Thus we are led to infer that to a normal human being the sight of a man on crutches gladdens the eye (p. 89), that there exists a general tendency "to rejoice in the sight of what is degraded, base or contemptible" (p. 89), that very laughable and therefore, according to this theory, very pleasing things are exhibitions of vanity, hypocrisy, lying and deceit. Prof. Sully makes out the following list of twelve classes of laughable things, i.e. things the spectacle of which provokes laughter:—(1) Novelties, (2) physical deformities, (3) moral deformities and vices, (4) disorderliness, (5) small misfortunes, (6) indecencies, (7) pretences, (8) want of knowledge and skill, (9) the incongruous and absurd, (10) word-plays, (11) that which is the expression of a merry mood, (12) the outwit-ting or getting the better of a person. We may perhaps strike out from this list the eleventh class, because it cannot properly be said that we laugh at that which is the expression of a merry mood; we should rather say that it excites our laughter through the force of sympathy and imitation. And we may perhaps emend the definition of the twelfth class and say that what we laugh at is the spectacle of the man being outwitted or got the better of. Laughable things, then, fall into eleven classes, each one of which is for most men highly displeasing when the specific character of the class is strongly marked, but provokes laughter in most of us, when in certain moods, if its specific character is but slightly marked, though to many men (the agelasts) the spectacle of any one of these things (with the possible exception of those of the first class) is at all times and in all degrees displeasing. And, in fact, well-nigh every instance of the ludicrous mentioned in the book is essentially displeasing in character, and even the laughter of the refined individual laugher, the humorist, is said to be fed on "the spectacle of folly, of make-believe and of self-inflation." Surely an unpleasing diet! It is significant, too, that laughter is not in-frequently provoked by the sudden announcement of a death or by the description of some extremely horrible experience or series of events, as also by a severe blow on the shin, on the "funny-bone" or on other parts of the body, and by situations that excite an unpleasant state of "nerves" or "needle."

If, then, we rid ourselves of the assumption that laughter is the expression of pleasure, we shall admit that, while on the one hand the noble, the beautiful, the harmonious, the orderly and the sublime are pleasing but not laughable, on the other hand the mean, the ugly, the incongruous, the riotous and the ridiculous are displeasing, although in certain circumstances they may provoke laughter; we shall admit, in short, that the laughable or the ludicrous is essentially displeasing, apart from the laughter that it may provoke. We may put alongside this conclusion two other indisputable facts of great significance; firstly, the fact that laughter, if not excessive, produces beneficial physiological effects of an exhilarating nature, it produces "accelerated circulation and more complete oxygenation of the blood" and "a considerable increase of vital activity by ways of heightened proving trimplation", secondary activity by way of heightened nervous stimulation"; secondly, the fact that laughter causes "a dispersion of the energies which for the maintenance of the attention ought to be concentrated. We are never less attentive during our waking life than at the moment of laughter."

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We have, then, these three facts :—(1) The things we laugh at are in themselves displeasing, (2) laughter disperses our attention, (3) laughter produces a general increase of the vital activities. When thus brought together, these facts irresistibly suggest that we, being but imperfectly adapted to the world in which we live and therefore necessarily surrounded by the depressing spectacle of suffering, of disorder and of incongruities, and sympathy being inwrought in the very bases of our constitution, have been endowed by beneficent Nature with the impulse to laugh at what is displeasing and painful in order that the automatically determined movements of laughter may disperse our attention, may prevent us attending to the displeasing spectacle and, by their stimulating effects, may counteract its depressing influence.

These facts suggest, in short, a theory of the ludicrous the exact converse of that which we may call the pleasure-theory; they suggest that we laugh at the ludicrous, not because it is

pleasing, but because it is painful.

Such a theory may appear at first sight somewhat paradoxical, and yet as an explanatory principle it may perhaps go further and deeper than any other. The truth of it appears clearly in those cases in which we begin by disliking a thing and proceed to ridicule it, i.e. to display it in its ludicirous aspects. Prof. Sully appears as an apologist and advocate of laughter, and yet even he recognises that laughter is not all joy, as when he says of modern laughter "there is in it from the first ejaculation something of a biting sensation or something of a melancholy pain," and again, "the laughable spectacle commonly shows us in the background something regrettable"; and of its function as a vitaliser or stimulant that enables us to bear up against the ills that surround us he has no doubt. "Some hearts of many chords...might break but for the timely comings of the laughter-fay with her transforming wand."

In considering any theory of the ludicrous, we must sharply distinguish between "laughter-at" and that simplest, most charming and infectious kind of laughter which is the overflow of good spirits and is fully explained by Herbert Spencer's principle of the overflow of surplus nervous energy into the most open tracks. "Laughter-at" is, of course, often combined with other forms of laughter, and the accompanying mental state may be extremely complex, yet the spectacle of the displeas-

ing seems to be its fundamental cause.

Just as in times and places in which the mass of men live under unnatural and depressing conditions the stimulating effects of alcohol are used not merely as a protection against cold, but are sought for their own sake, so the spectacle of the coarse and brutal comes to be sought for the sake of the stimulating effects of laughter, normally a protection against depressing mental influences; we have then the curious phenomenon of the crowd flocking to the circus and the pantomime (to have a good laugh, as they frequently say), where the staple source of laughter is the buffeting of the clowns, blows being apparently dealt which, if witnessed in real life, would make one-half the spectators feel sick and faint. We may note, too, how in the course of a football match a heavy fall or a violent collision between the players calls forth a roar of laughter from the crowd and so adds to the attractions of the spectacle.

The consideration of the laughter caused by tickling also points away from the "pleasure-theory" and supports the theory here suggested. There can be little doubt that the sensation of tickling is in itself distinctly unpleasant, both to the child and to the adult, even while the victim responds with loud laughter; the enjoyment of the situation by the child seems to be analogous to its enjoyment in being mildly frightened or in any other vivid and lively experience. And Prof. Sully himself tells us that "much, at least, of the later and more refined laughter is

analogous to the effect of tickling."

It may seem at first sight that the view proposed is merely an application of, and involves the acceptance of, the Lange-James theory of the emotions, and that Prof Sully has dealt with it in those pages in which he very properly rejects that theory; but this is by no means the case, for laughter is not an emotion, but a state of the physical organism (producing certain effects in consciousness) that may accompany almost any emotional state. If we accept the view here suggested, we may surmise that the laughter reaction has been developed as a necessary corrective of the effects of sympathy, for the power of sympathy is so great that in the absence of this corrective those spectacles, which meet us on every hand and which we call the ludicrous, might well destroy us.

In making this suggestion, it is not intended to deny the plurality of causes in most cases of "laughter-at," for, though the principle suggested may indicate the predominating factor in the case of the coarse laughter of low minds, in highly developed minds it becomes so overlaid with complicating factors as to be with difficulty distinguishable in many cases. If the principle suggested be regarded as inadmissible, the violence of the laughter-reaction must remain something of a mystery, for it is altogether disproportionate to the causes that are assigned

to it. The acceptance of this theory would in no wise invalidate those theories of the social functions of laughter developed by Prof. Sully in a most interesting manner, but would rather strengthen them, because it would make clear the cause of the universal dislike to being laughed at, a point which for the pleasure-theory of laughter remains obscure.

W. McDougall.

Insects and Petal-less Flowers.

PROF. PLATEAU, of the University of Ghent, has for many years carried on a series of important experiments concerning the ways of insects in visiting flowers. He contends that they are not attracted by the brilliant colours of the blossoms, but rather by the perception in some other way—probably by scent—that there is honey or pollen.

I have just received from Prof. Plateau an account of some of his most recent work, and it seems of sufficient interest and importance to lay before the readers of NATURE. His paper, "Les Pavots décorollés et les insectes Visiteurs," is a record of experiments carried on during 1901 and 1902 and published in the Bulletins de l'Académie royale de Belgique, November, 1902.

Flowers of *Papaver Orientale*, L., were deprived of their petals, and the number of insects visiting the remaining parts carefully noted and compared with the number of those visiting

neighbouring intact flowers.

Now it seems evident that the question, Are insects attracted by the brilliant colours of flowers? should be decisively answered by such experiments. If they are thus attracted, then we should expect them to neglect these petal-less flowers while visiting the others. In removing the petals, Prof. Plateau took certain precautions. The unopened flower was carefully enclosed in a sort of cage, so as to preclude insect visits. When it expanded, the petals were carefully removed by means of a pair of scissors kept specially for this purpose. Great care was taken to avoid touching any of the remaining parts of the flower with the fingers. Prof. Plateau lays special stress on this, as he thinks that certain previous experiments of a similar nature have been vitiated by neglecting such a precaution. The experimenter in removing the corolla has left on the remaining parts the scent of human fingers. Its keen sense of smell enabling the insect to perceive this, it has consequently avoided the flower.

The poppy flowers thus carefully prepared were watched, and the number and kind of insects visiting them noted. At the same time, a number of intact flowers were similarly watched. Here are the results as summed up by Prof. Plateau:—

In the 30 petal-less flowers.	No. of visits.	In the 70 normal flowers.		No. of visits.
Apis mellifica	97			121
Megachile centuncularis	I			I
Osmia aurulenta	0			I
Halictus sexnotatus	19			18
Oxybelus uniglumis	14			29
Small unidentified Hy-	-			-
menoptera	. 0			1
Melanostoma mellina	. 4			0
Syrphus corollae	1			0
Telephorus lividus	I			I
_				_
Total	137			172

Or taking the average, each of the 30 petal-less flowers received 4.5 visits, each of the 70 normal flowers received 2.4 visits.

So great, indeed, appeared to be the attraction of these petal-less flowers that on many occasions Prof. Plateau has seen more than one bee in a single flower. Here are his figures on this point:—

-		T	imes.	
2 hive bees in same flower		 	9	
3 , ,,		 	2	
I hive bee and I Halictus		 	2	
2 hive bees and 1 Halictus		 	I	
1 Halictus and 1 Oxybelus		 	I	
2 Oxybelus	,	 	I	

Insect visits to flowers which have naturally lost their petals are by no means uncommon. Darwin noted them in certain flowers. I have myself seen bees visiting flowers of Geranium phaeum, Helianthemium vulgare, Rubus fruticosus and Salvia officinalis which had lost their petals.

13 Vicarage Drive, Eastbourne. G. W. BULMAN.